**Classification of local anesthetics**

* Classified by their chemical structure (esters & amides)
  + The terms ester and amide refers to the types of chemical linkages found within the anesthetic molecules
* Why did amides replaced the esters?
  + classified by their chemical structure; either **esters** or **amides**; refers to the types of chemical linkages found within the anesthetics molecule
  + amides have largely replaced the esters because they produce fewer side effects and generally have a longer duration of action
* Local anesthesia: occurs when sensation is lost to a limited part of the body without loss of consciousness; loss of sensation to a relatively small part of the body without loss of consciousness to the patient

**Stages of general anesthesia**

* requires different classes of drugs that cause loss of sensation to the entire body, resulting in a loss of consciousness; loss of sensation throughout the entire body accompanied by a loss of consciousness
  + Applied when it is necessary for patients to remain still without pain for a longer time than could be achieved with local anesthetics
  + Goal = provide a rapid and complete loss of sensation; depress most nervous activity in the brain
* Progressive process that occurs in 4 distinct phases (Table 19.3)

|  |  |
| --- | --- |
| **Stage** | **Characteristics** |
| Phase 1 | * loss of pain; * patient loses gen. sensation but may be awake * this stage proceeds until the patient loses consciousness |
| Phase 2 | * Excitement & Hyperactivity * Patient may be delirious & try to resist treatment * HR & breathing may become irregular * BP can increase * IV agents are administered here to calm the patient |
| Phase 3 | * Surgical anesthesia * Skeletal muscles become relaxed and delirium stabilizes * Cardiovascular & breathing activities stabilize * Eye movements slow * Patient becomes still * Surgery begins & remains until the procedure ends |
| Phase 4 | * Paralysis of the medulla region of the brain (responsible for controlling respiratory & CV activity) * If breathing or the heart stops, death could result * This stage is usually avoided during gen. anesthesia |

**Topical Anesthetics**

* Formulation/Method - Creams, sprays, suppositories, drops, & lozenges
* Description - Applied to mucous membranes including the eyes, lips, gums, nasal membranes, and throat; very safe unless absorbed

**Table 19.4 Inhaled General Anesthetics**

* Gas (nitrous oxide) - Adverse Effects
  + Malignant hyperthermia
  + Apnea
  + Cyanosis

**Table 19.6 Selected Adjuncts to Anesthesia**

* Neuromuscular blocker - Succinylcholine (Adverse effect)
  + Respiratory depression
  + Malignant hyperthermia
  + Apnea
  + Circulatory collapse

**Prototype drug Succinylcholine**

* Action and Uses – acts on cholinergic receptor sites at neuromuscular junction
  + 1st depolarization occurs & skeletal muscle contracts
  + After repeated contractions, the membrane is unable to repolarize as long as the drug stays attached to the receptor
  + Effects are 1st noted as muscle weakness & muscle spasms
  + Eventually paralysis occurs
  + This drug is rapidly broken down by cholinesterase
  + When infusion is stopped, the duration of action is only a few minutes
  + Use of this drug reduces the amount of general anesthesia required for a procedure
  + Dantrium is a drug used preoperatively/postoperatively to reduce the signs of malignant hyperthermia in susceptible patients

**Mechanism of action of local anesthetics**

* **Local anesthetics** = drugs that produce a rapid loss of sensation to a limited part of the body by blocking entry of sodium ions into the neurons
  + [Na+] is higher outside the neurons than inside; a rapid influx of [Na+] into the cell is necessary for neurons to fire
  + Local anesthetics act by blocking Na+ channels
  + blocking Na+ channels is a nonselective process so both sensory and motor impulses are affected
  + so both sensation and muscle activity will temporarily diminish in the area treated with the local anesthetic
* also called *sodium channel blockers* because of the mechanism of action
* What is the rationale of adding epinephrine?
  + Small amounts of epinephrine are sometimes added to the anesthetic solution to constrict blood vessels in the immediate area where the local anesthetic is applied
  + This keeps the anesthetic in the area longer, thus extending the duration of action of the drug

**Inhaled anesthetics (Nursing Implications)**

* Inhaled agents are used to maintain the anesthesia
* Should be used cautiously in patients with myasthenia gravis
  + It may cause respiratory depression and prolonged hypnotic effects
* Patients with cardiovascular disease, especially those with increase intracranial pressure, should be carefully monitored
  + Hypnotic effects of the drug may be prolonged or potentiated
* Always assess for past history of surgeries and response to anesthesia
* Asses past history, allergies and medications
* Assess use of alcohol, illicit drugs, and opioids
* Assessment is vital during pre-, intra-, and postoperative phases
  + Vitals, baseline lab work, ECG, pulse oximeter, ABCs (airway, breathing, circulation, monitor all body systems)
* Reorient patient to his or her surroundings
* Provide preoperative teaching about the surgical procedure and anesthesia
* Teach the patient about postoperative turning, coughing, & deep breathing

**Adverse Effects of Local anesthetics**

* CNS stimulation (restlessness or anxiety)
* Drowsiness
* Unresponsiveness
* Hypotension
* dysrhythmias

**Inhaled anesthetics**

* the only gas used routinely for anesthesia is nitrous oxide, commonly called laughing gas
  + used for dental procedures & brief obstetric and surgical procedures
  + also used in conjunction with other general anesthetics making it possible to decrease their dosages with greater effectiveness
* What is the rationale for the use of IV before Gas anesthetics?
  + Concurrent administration of IV and inhaled anesthetics allows the dose of the inhaled agent to be reduced, thus lowering the potential for serious side effects
  + When IV & inhaled anesthetics are combined, they provide greater analgesia and muscle relaxation than can be provided by the inhaled anesthetic alone

**Spinal anesthesia**

* Formulation/Method - Injection into the cerebral spinal fluid (CSF)
* Description - Drug affects a large, regional area such as the lower abdomen & legs
* Postoperative Care?
* Priority Nursing Interventions?

**Local Anesthetics:** drugs that produce a rapid loss of sensation to a limited part of the body by blocking entry of sodium ions into the neurons

* occurs when sensation is lost to a limited part of the body without loss of consciousness; loss of sensation to a relatively small part of the body without loss of consciousness to the patient

**Table 19.1 Methods of local anesthetics administration**

|  |  |  |
| --- | --- | --- |
| **Route** | **Formulation/Method** | **Description** |
| Epidural anesthesia | Injection into the epidural space of the spinal cord | Most commonly used in obstetrics during labor & delivery |
| Infiltration (field block) anesthesia | Direct injection into tissue immediate to the surgical site | Drug diffuses into tissue to block a specific group of nerves in a small area close to the surgical site |
| Nerve block Anesthesia | Direct injection into tissue that may be distant from the operation site | Drug affects nerve bundles serving the surgical area; used to block sensation in a limb or large area of the face |
| Spinal Anesthesia | Injection into the cerebral spinal fluid (CSF) | Drug affects a large, regional area such as the lower abdomen & legs |
| Topical (surface) anesthesia | Creams, sprays, suppositories, drops, & lozenges | Applied to mucous membranes including the eyes, lips, gums, nasal membranes, and throat; very safe unless absorbed |

**Neuromuscular blocker agent**

* drug used to cause total muscle relaxation; cause skeletal muscles to totally relax in order to carry out surgical procedures safely
* administration of these drugs also allows the amount of anesthetic to be reduced
* Classified as depolarizing blockers (succinylcholine) and nondepolarizing blockers (Mivacurium)
  + Succinylcholine – works by binding to acetylcholine receptors at neuromuscular junctions to cause total skeletal muscle relaxation; Also used in surgery for ease of tracheal intubation
  + Mivacurium – short acting; cause muscle paralysis by competing with acetylcholine for cholinergic receptors at neuromuscular junctions; once attached to the receptor, the nonpolarizing blockers prevent muscle contraction

**Table 19.4 Inhaled General Anesthetics**

* Volatile Liquid – Halothane (Fluothane)
  + Myocardial depression
  + Hypotension
  + Pulmonary vasoconstriction
  + hepatotoxicity

**Prototype drug Nitrous oxide**

* Treatment of overdose – metoclopramide may help reduce the symptoms of nausea & vomiting associated with inhalation

**Table 19.5 Intravenous Anesthetics (Adverse Effects)**

* Propofol (Barbiturate/Barbiturate-like)
  + Circulatory dep. w/ apnea
  + Respiratory dep. w/ apnea
  + Laryngospasm
  + anaphylaxis
* Midazolam hydrochloride (benzodiazepine)
  + CNS depression
* Ketamine (miscellaneous)
  + Dissociation
  + Increased BP
  + Increased pulse rate
  + Confusion
  + Excitement